might occur in rocks now coarsely crystalline. As time went on, true sediments would predominate over extravasated materials, and these would be less and less affected by chemical changes, and would more and more retain their original character. Thus we should expect that as we retraced the earth's course through "the corridor of time," we should arrive at rocks which, though crystalline in structure, were evidently in great part sedimentary in origin, and should beyond them find rocks of more coarsely-crystalline texture and more dubious character, which, however, probably were in part of a like origin; and should at last reach coarsely-crystalline rocks, in which, while occasional sediments would be possible, the majority were originally igneous, though modified at a very early period of their history. This corresponds with what we find in Nature, when we apply, cautiously and tentatively, the principles of interpretation which guide us in stratigraphical geology.

I have stated as briefly as possible what I believe to be facts. I have endeavoured to treat these in accordance with the principles of inductive reasoning. I have deliberately abstained from invoking the aid of "deluges of water, floods of fire, boiling oceans, caustic rains, or acid-laden atmospheres," not because I hold it impossible that these can have occurred, but because I think this epoch in the earth's history so remote and so unlike those which followed, that it is wiser to pass it by for the present. But unless we deny that any rocks formed anterior to or coæval with the first beginning of life on the globe can be preserved to the present time, or, at least, be capable of identification (an assumption which seems to me gratuitous and unphilosophical) then I do not see how we can avoid the conclusion to which we are led by a study of the foundation-stones of the earth's crust—namely, that these were formed under conditions and modified by environments which, during later geological epochs, must have been of very exceptional occurrence. If, then, this conclusion accords with the results at which students of chemistry and students of physics have independently arrived, I do not think that we are justified in refusing to accept them, because they lack the attractive brilliancy of this or that hypothesis, or do not accord with the words in which a principle, sound in its essence, has been formulated. It is true in science, as in a yet more sacred thing, that "the letter killeth, the spirit giveth life."

SYSTEMATIC RELATIONS OF PLATYPSYLLUS AS DETERMINED BY THE LARVA.

PROF. C. V. RILEY, in a paper read at a recent meeting of the National Academy of Science (U.S.A.), drew attention to the unique character of *Platypsyllus castoris*, a parasite of the beaver; and gave an epitome of the literature on the subject, showing how the insect had puzzled systematists, and had been placed by high authority among the Coleoptera and the Mallophaga, and made the type even of a new order. He showed the value, as at once settling the question of its true position, of a knowledge of the adolescent states. He had had since November 1886 some 14 specimens of the larva, obtained from a beaver near West Point, Nebraska, and had recently been led to study his material at the instance of Dr. Geo. H. Horn, of Philadelphia, who at a recent meeting of the Entomological Society of Washington announced the discovery of the larva by one of his correspondents the present spring, and will publish a full description of it. Prof. Riley indicated the undoubted Coleopterological characteristics of the insect in the imago state, laying stress on the large scutellum and five-jointed tarsi, which at once remove it from the Mallophaga, none of which possess these characters. He also showed that the larva fully corroborates its Coleopterological position, and that its general structure, and particularly the trophi, anal cerci, and pseudopod, confirm its Clavicorn affinities. He showed that the atrophied mandibles in the imago really existed as described by Le Conte, and that even in the larva they were feeble and of doubtful service in mastication. He mentioned, as confirmatory of these conclusions, the finding by one of his agents, Mr. A. Koebele, of Leptinillus (the Coleopterological nature of which no one has doubted, and the nearest ally to Platypsyllus), associated with Platypsyllus upon beaver-skins from Alaska; also the parasitism of Leptinus upon mice. He paid a high compliment to the judgment and deep knowledge of the late Dr. Le Conte, whose work on the imago deserves the highest praise, and whose conclusions were thus vindicated. "Platypsyllus therefore," he concluded, "is a good Coleopteron, and in all the characters in which it so strongly approaches the Mallophaga it offers merely an illustration of modification due to food, habit, and environment. In this particular it is, however, of very great interest as one of the most striking illustrations we have of variation in similar lines through the influence of purely external or dynamical conditions, and where genetic connection and heredity play no part whatever. It is at the same time interesting because of its synthetic characteristics, being evidently an ancient type, from which we get a very good idea of the connection in the past of some of the present well-defined orders of insects."

SCIENTIFIC SERIALS.

Atti della R. Accademia dei Lincei, July and August 1888.—In both of these numbers G. Vicentini and D. Omodei continue their important inquiries on the thermic expansion of certain binary alloys in the liquid state. So far they have arrived at the following general conclusions: (1) the variation of volume accompanying liquid metallic mixtures is extremely slight; (2) no relation can be established between the variations of volume that accompany the formation of alloys in the solid and liquid states; (3) the variation of density at the moment of solidification is in general less than would be the case were the constituent metals to preserve in the alloys the value that they possess in the isolated state; (4) the binary alloys of lead and tin, of tin and bismuth, and of tin and cadmium, possess in the state of perfect fusion an expansion equal to that resulting from the sum of the expansions of the associated metals; (5) the alloy of Bi_2Pb possesses a coefficient of expansion far greater than the sum of the expansions of the constituent metals. These experiments, which conclude for the present with a preliminary study of the antimony and zinc alloys, have been carried out at the physical laboratory of the University of Cagliari, Sardinia.

Rivista Scientifico-Industriale, October.—Experiments made with Crookes's radiometer, by Prof. Pietro Lancetta. The experiments here described have been undertaken chiefly for the purpose of making a synthesis of certain phenomena which are more easily produced by this apparatus than by any other means. It is also shown that the radiometer may in some cases be more advantageously employed than the ordinary thermometer, especially in testing certain laws regarding latent and luminous heat, Crookes's instrument being sensible both to the dark and luminous wave of the solar rays. The results of the experiments show generally that in a homogeneous medium the radiation of the thermo-luminous wave is propagated in a straight line; that the luminous wave is propagated *in vacuo*; that the intensity of the thermo-luminous wave is in inverse ratio to the square of the distance; that the evaporation of fluids as well as the rarefaction of gaseous bodies is accompanied by a lowering of the temperature, while the condensation of gas develops heat.

Journal of the Russian Chemical and Physical Society, vol. xx. fasc. 6.—On the speed and the products of decomposition of the chlorate and chlorite of lithium, by A. Potilitzin, being the second part of an inquiry into the properties of galloid compounds. The decomposition of the two above-mentioned salts, as well as of the bromate of barium, is best explained according to the law of unstable equilibrium indicated by the author in his former works, and which he sums up as follows: in each chemical reaction the equilibrium of the system depends upon the values of their atomic weights, their masses, and their stock of potential energy.—On the relation between the rotatory power and the refraction of organic compounds, by J. Kanonnikoff, first part.—On the action of organic iodides on natrium-nitro-ethane, by N. Sokoloff.—Obituary notice of Prof. Wroblewski, by S. Lamansky.—The total eclipse of the sun of August 19, 1887, by N. Egoroff; and on the results of meteorological observations during the same eclipse, by N. Hesehus.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 31.—"On the Effect of Occluded Gases on the Thermo-electric Properties of Bodies, and on their Resistances; also on the Thermo-electric and other Properties of Graphite and Carbon." By James Monckman, D.Sc. Communicated by Prof. J. J. Thomson, F.R.S.

A piece of platinum wire about 18 inches long was bent in the middle, and one-half protected by being covered with glass tube and made water-tight at the lower end. After annealing the free portion and testing until perfectly free from all strain effects, it was placed, up to about the middle, in acidulated water, and made the negative pole of a battery, and hydrogen liberated upon it for a few minutes. After being dried it was tested with a small flame at distances 1 cm. along its whole length. The result was a current from free wire towards that part on which hydrogen had been produced, greatest at the junction of the free wire and the saturated wire.

When wires of palladium were used, more powerful effects of the same kind were produced.

Carbon rods were next tried. It was found that when one of these rods was heated and placed against the other, the current was always from cold to hot below 200° C.

They were then used as the electrodes in decomposing dilute sulphuric acid, dried carefully until no current was produced on placing them in contact. On heating either rod and joining them as before, a current was produced from hydrogen to oxygen across the hot junction.

The same effect was obtained by decomposing hydrochloric acid solution.

Resistance.—To get rid of possible error from change of temperature, two wires of equal length and section were used and balanced against each other.

These were placed in water, and a current passed from the one to the other, allowed to remain in the acid a little to cool if necessary, and afterwards removed, dried, and placed in an empty glass vessel surrounded with a considerable quantity of water. There they rested until the temperature became the same as the water. When measured, the resistance of the wire containing the hydrogen was found to have increased about one-thousandth part.

Carbon.—Two thin rods about 2mm. diameter were electroplated at the ends and soldered to insulated copper wires.

When used as the poles of a battery the change of resistance was considerable, but greater on the rod that had been the positive pole. By using a platinum electrode, hydrogen or oxygen was produced at will upon the same rod, the other rod remaining unchanged. It then appeared that oxygen increased the resistance much more than hydrogen, rising in some cases as high as nine times; that when oxygen was liberated twice or thrice in succession the resistance increased each time. This continued increase was probably due to chemical changes produced by the active oxygen. Hydrogen gave an increase of resistance, not continuing beyond a certain point, and not becoming greater on repeated charging with the gas.

Generally also the effect of the hydrogen was temporary, disappearing, wholly in some cases, partially in others, when short circuited.

Superposition of Polarization.—Part of the change in the carbon is evidently produced by the mechanical action of the gases evolved, and by the chemical action of the oxygen; both of these will, however, produce permanent changes. That only part of the action is to be explained in this way is shown by the previous experiments. It is, however, further demonstrated by using two carbon rods in decomposing acidulated water; after passing the current for one minute, reverse it for one-tenth of a second and immediately join up to a galvanometer. A short but violent deflection appears for the latter contact, gradually falling to zero and passing to the other side, where it remains for a considerable time, though with much decreased quantity.

The same thing was obtained with platinum electrodes. The second contact must be very short, or the former polarization disappears.

Thermo-electric and other Properties of Graphite and Carbon.—In making the previous experiments, I had occasion to place the heated end of one carbon rod in contact with the cold end of another. The temperature of the hot end was varied from 30° C. to a red heat, whilst the cold end was kept at about 17° C.

Currents of electricity were of course produced. When the temperature of the hotter rod was raised but slightly, the current was from cold to hot through the point of contact, but when it was raised to a red heat the current passed from hot to cold.

I was led to expect that the line of carbon in a thermo-electric diagram, in which the area of the space between the lines is proportional to the electromotive force, would show a bend of some kind, and as no researches were known showing such a bend, it appeared desirable to test it carefully.

Near one end of a carbon rod a hole, about 5 mm. in diameter, was drilled, and into this the end of a platinum wire was inserted and fixed by being wedged with a piece of rod carbon. The whole was thoroughly covered with Indian ink, which, when dry, was again covered with clay. The carbon rod was insulated from the platinum wires, and they from each other by thin sheet asbestos and mica, by which means it was insulated from the vessel in which it was placed, and luted with clay to prevent access of air. From several series of experiments a thermo-electric line was calculated, and found to rise from 0° to 250°, beyond which it descended at the same rate.

Other Changes in the Properties of the Body at the same Temperature.

This change in the thermo electric power of carbon is accompanied by other changes. The resistance, the expansion, and the specific heat all appear to undergo a corresponding alteration, as the following summary of results shows:—

	Below 250° C.	Above 250° C.
A. Effect of contact of hot and cold carbon.	Current from cold to hot.	Current from hot to cold.
B. Thermo-electric line	Rises.	Falls.
C. Rate of decrease of resistance per degree per ohm	Diminishes.	Increases.
D. The rate of increase of the coefficient of expansion	Increases.	Decreases.
E. Rate of increase of the specific heat	Fairly regular.	Falls to half.

Geological Society.—November 7.—Dr. W. T. Blanford, F.R.S., President, in the chair.—The following communications were read:—The Permian rocks of the Leicestershire coal-field, by Horace T. Brown. According to Mr. Brown, the Permian rocks of the Leicestershire coal-field belong to the same area of deposition as those of Warwickshire and South Staffordshire, all having formed part of the detrital deposits of the Permian lake which extended northwards from Warwickshire and Worcestershire, and which had the Pennine chain on its eastern margin. He pointed out the dissimilar nature of these deposits to those of the eastern side of the Pennine chain from Nottingham to the coast of Durham. There were proofs of the existence of a land barrier, owing to the uprising of the Carboniferous, between the district round Nottingham and the Leicestershire coal-field. The most northerly exposure of the Leicestershire Permians is thirteen miles south-west of those of South Notts. He indicated the probable course of the old coast-line of the western Permian lake. Denudation had bared some of the older Palæozoics of their overlying Coal-measures, and it is the rearranged talus from the harder portions of these older rocks which now forms the brecciated bands in the Leicestershire Permians. The reading of the paper was followed by a discussion, in which the President, Prof. Bonney, Mr. Whitaker, Prof. Blake, and Mr. Topley took part.—On the superficial geology of the central plateau of North-Western Canada, by J. B. Tyrrell, Field Geologist of the Geological and Natural History Survey of Canada. The drift-covered prairie extends from the west side of the Lake of the Woods to the region at the foot of the Rocky Mountains, rising from a height of 800 feet on the east to 4500 feet on the west, the gentle slope being broken by two sharp inclines known as the Pembina Escarpment and the Missouri Coteau, giving rise to the First, Second, and Third Praire Steppes. The author described the older rocks of this region, referring especially to his subdivision of the Laramie formation into an Edmonton series of Cretaceous age, and a Pascapoo series forming the base of the Eocene, and then discussed the superficial deposits in the following order: (1) *Preglacial gravels;* occurring along the foot of the Rocky Mountains, composed of waterworn quartzite pebbles, similar to those now forming, and, like them, produced by streams flowing from the mountains; (2) *Boulder-clay* or *Till;* (3) *Interglacial deposits* of stratified material; (4) *Moraines;* (5) The *Kames* or *Åsar*, generally occurring at the bottoms of wide valleys; (6) *Stratified deposits* and beach-ridges which have been formed at the bottoms and along the margins of fresh-water lakes lying along the foot of the ice-sheet; (7) *Old Drainage-channels.* Some remarks on this paper were made by the President, Dr. Hinde, Mr. Whitaker, Mr. Topley, and Mr. Marr.

PARIS.

Academy of Sciences, November 12.—M. Janssen in the chair.—On the cultivation of the square-eared variety of wheat in 1887 and 1888, by MM. E. Porion and P. P. Dehérain. The results of two years' experience in various parts of France show that this variety of red wheat yields under favourable conditions crops which till lately would have been thought fabulous. It succeeds best on well-drained heavy clay soils in the central and northern provinces, and if well manured and sown in regular furrows gives splendid returns; it also shows more power of resisting the destructive action of wind and rain than any other kind.—On the nature of milk, by M. A. Béchamp. This is a reply to the question, Does milk contain any anatomical elements of the system, and if so, do the lacteous globules represent any of these elements? The author's studies lead to the conclusion that milk is not an emulsion; that the lacteous globules are real adipose vesicles in a free state, and that cows' milk contains, besides caseine, other albuminoid substances, not in a free state, but combined in solution with alkalies.—Calculation of the tensions of sundry vapours, by M. Ch. Antoine. Here the general formula $\log p = A\left(D - \frac{1000}{\theta}\right)$ is applied to a number of vapours such as benzene, chloroform, alcohol, carbon chloride, ether, acetone, and carbonic acid, and the comparative results are given for the five temperatures that served as the base for the calculation of Regnault's new formula. The final formulas thus obtained, which had never been worked out by Regnault, must henceforth be adopted in studying the properties of the vapour of acetone.—A new method of improving the capacity of very long telegraphic lines, by M. Fernand Godfroy. This method consists in establishing at each extremity of the line a connection with earth, having a coefficient of self-induction powerful enough, if not to compensate the usual waste, at least greatly to diminish it by the inverse effects which the self-induction tends to produce. The method has already been tried with marked success, on several underground lines, amongst others that between the Paris central station and Angoulême, a distance of 300 miles. Here it was found possible to signal at the rate of twenty words per minute with an *ordinary* Morse apparatus, without any intermediate or local translator, and utilizing one direction only of the current.—On the silicated combinations of glucine, by MM. P. Hautefeuille and A. Perrey. The elements of a leucite or volcanic schorl with aluminia or glucine base ($4SiO_2,Al_2O_3,KO$, or $4SiO_2,Gl_2O_3,KO$), heated between 600° and 800° C. with an excess of neutral vanadate of potassa, are rapidly mineralized. But the nature of the resulting crystals varies in the course of the same operation according as the mineralizing agent yields to the product by which an increasing portion of its alkali is crystallized. Thus this product is homogeneous only under exceptional conditions, and as a rule is a mixture of several chemical species, whose separation is here studied.—Presence of glycolic acid and of normal propylenedicarbonic acid in the grease of sheep's wool, by MM. A. and F. Buisne. In the process of analyzing sheep-washings, the authors have succeeded in isolating these two acids, which are here described. The latter, with formula $COOH—CH_2—CH_2—CH_2—COOH$, is shown to be a higher homologue of succinic acid.—On the Hersiliidæ, a new family of parasitic Copepods, by M. Eugène Canu. Thanks to his discovery at Wimereux of two new genera closely allied to the Hersilia, and parasites of various invertebrates, the author has come to the conclusion that the Hersilia should constitute a new family as distinct from the Siphonostoms as they are from the Peltidians. A full anatomical description is given of this family of Hersiliidæ.—On a new geological map of France, by MM. Jacquot and Michel Lévy. This map, which is on the scale of 1 : 1,000,000, will be issued by the French Geological Service before the close of the year, and will embody the latest researches, including the unpublished reports for 1884-86.—M. du Chatellier has a note on the continued subsidence of the Finistère coast, Brittany; and M. V. Galtier describes some fresh experiments tending to show the efficacy of intra-venous injections of the virus of rabies as a prophylactic against the bite of mad dogs.

Astronomical Society, November 3.—M. C. Flammarion, President, in the chair.—M. Riccò sent a description of a sun-spot observed from November 12 to 25, 1882. This spot, the largest ever observed, had an area over fifty times that of a great circle of the earth. It exhibited rose-coloured veils in some parts, and the nuclei were crossed by large yellow arcs.—M. Gaudibert sent a drawing of Eratosthenes, showing twelve hills within the ring, and a multitude of small craters on the east.—M. Blot, of Clermont (Oise), sent an elementary demonstration of the formula $v^2 = \mu\left(\frac{2}{R} - \frac{1}{a}\right)$, which gives the velocity of a planet in terms of the major axis and of the radius-vector.—Observations of meteors, by M. de Alcantara Penya at Majorca, on June 23, at 7.20 p.m.; by Baroness Ottenfels in the Gulf of Juan, on July 17, at 9 p.m.; by M. Henrionnet at Troyes, on September 9, at 9.30 p.m.—Observations of sun-spots, by MM. Bruguière, Henrionnet, and Loiseau; and of Sawerthal's comet, by MM. Guillaume and Kropp.—M. Guiot, of Soissons, saw the companion to Sirius with a $3\frac{3}{4}$-inch refractor, and observed Vesta with the naked eye from September 5 to 20.—M. Ferret photographed the moon with a $3\frac{3}{4}$-inch refractor.—M. Duprat sent an observation of the lunar eclipse of July 23 made at Constantine.—M. Lihou observed an occultation of a seventh magnitude star by Jupiter.—M. Foray observed Venus on the day of its conjunction, with a 4-inch refractor.—The Sociétés Scientifiques Flammarion, of Marseilles, Argentan, Bruxelles, Jaën, and Bogota, were elected Corresponding Societies.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

The Orchids of the Cape Peninsula: H. Bolus (Cape Town).—Monographs of the United States Geological Survey, vol. xii. (Washington).—Atlas to accompany a Monograph on the Geology and Mining Industry of Leadville, Colorado: S. F. Emmons (Washington).—Report of the Meteorological Service of the Dominion of Canada for the year ending December 31, 1885 (Ottawa).—The Kingdom of Georgia: O. Wardrop (Low).—New Zealand of To-day: J. Bradshaw (Low).—Physical Realism: T. Case (Longmans).—Cours de Thermodynamique: M. Lippmann (Paris, Georges Carre).—Truth for its own Sake—the Story of Charles Darwin: W. Mawer (Sonnenschein).—Travaux et Mémoires du Bureau International des Poids et Mesures, Tome vi. (Paris, Gauthier-Villars).—Birds in Nature: R. B. Sharpe (Low).—Orient Line Guide, 3rd edition: edited by W. J. Loftie (Low).—The Least of All Lands: W. Miller (Blackie).—Bulletin de la Société Astronomique de France, Première Année, 1887 (Paris).—Transactions and Proceedings of the Royal Society of Victoria, vol. xxiv. Part 2 (Williams and Norgate).—Bolletino della Società di Naturalisti in Napoli, Serie ii., vol. ii., Anno 2, Fasc. 2 (Napoli).

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